Velho, I., Tiago, J., Gambaruto, A., Sequeira, A., Goodarzi Ardakani, V., Tu, L., & Pereira, R. (2019). CFD analysis for the evaluation of patient-specific hemodynamic parameters in cerebral aneurysms. In J. Henriques, N. Neves, & P. De Carvalho (Eds.), *15th Mediterranean Conference on Medical and Biological Engineering and Computing* (pp. 1353-1360). (IFMBE Proceedings; Vol. 76). Springer. https://doi.org/10.1007/978-3-030-31635-8_165

Peer reviewed version

Link to published version (if available):
10.1007/978-3-030-31635-8_165

Link to publication record in Explore Bristol Research
PDF-document

Title: CFD analysis for the evaluation of patient-specific hemodynamic parameters in cerebral aneurysms

Authors:
Iolanda Velho*, Alberto Gambaruto**, Jorge Tiago*, Adélia Sequeira*, Vahid Ardakani**, Xin Tu**, Ricardo Pereira***

* Instituto Superior Técnico, ULisboa
** University of Bristol
*** CHUC – Centro Hospitalar e Universitário de Coimbra

Blood flow simulations are now considered a valuable tool for a deeper understanding of the physiopathology of intracranial aneurysms. Many authors built robust computational settings based on accurate computer-assisted registration, segmentation, and 3D geometry reconstruction from medical images of patient specific cerebral aneurysms, and special techniques to derive appropriate boundary conditions. However, an accurate description of flow mechanics in the near wall region and its connection with the evolution of the wall disease evolution remains linked to several questions not yet fully understood. Recently, several authors have suggested a lower order approximation of the Lagrangian dynamics in the near wall region, which allows for a meaningful characterization of both normal and parallel direction to the wall. We verify this computational approach with a cohort of brain aneurysms and try to provide a step further in the understanding of the hemodynamic environment and its possible connection with the risk of rupture.

[1] V. Ardakani, I. Velho, X. Tu, A.M. Gambaruto, J. Tiago, R. Pereira, A. Sequeira, “Near-wall flow in cerebral aneurysms” *Fluids*, in press.

[2] A. Arzani, A.M. Gambaruto, G., Chen, S.C. Shadden, “Lagrangian wall shear stress structures and near-wall transport in high-Schmidt-number aneurysmal flows”. *Journal of Fluid Mechanics*, vol 790., pp. 158-172, 2016.

[3] A.M. Gambaruto, D.J. Doorly, and T. Yamaguchi, “Wall shear stress and near-wall convective transport: Comparisons with vascular remodeling in a peripheral graft anastomosis,” *Journal of Computational Physics*, vol. 229, no. 14, pp. 5339–5356, 2010.